MSc in Digital Signal Processing and Communications (full-time)
For students entering in 2013/4

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject Benchmarking group(s):	Engineering
Faculty:	Science Faculty
Programme length:	1 year
Date of specification:	12/Aug/2013
Programme Director:	Prof Chris Guy
Programme Advisor:	Eur Ing Dr R. Simon Sherratt
Board of Studies:	MSc in DSPC
Accreditation:	Accredited by the IET

Summary of programme aims
The programme aims to provide an industry-oriented Masters course in digital signal processing and communications (DSPC), covering not only the theoretical but also the implementation aspects of the subject, thus allowing the students, upon graduation, to be job-ready.

The programme aims to provide students with:

- An in-depth understanding of DSP theory;
- A thorough familiarisation with, and hands-on experience of, real-time or embedded DSP implementation;
- A broad training in both digital communications and digital signal processing - two historically separate but rapidly converging areas;
- An appreciation of current and future wireless communications systems (*e.g.* 3GPP, 802.11a/b/g, 802.15 and 802.16 or WiMax);
- An opportunity to interact with senior engineers from the industry, as some of the modules will be taught by external experts from industry (a key feature of this programme);
- An easier choice for the next step in their career. Students can either pursue a career in academia by continuing onto a PhD programme, or join the DSP or wireless communications industry immediately after graduation.

Transferable skills
As part of this programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematical software, scientific programming), scientific writing, oral presentation, team-working, problem-solving, use of library resources and time-management.

Programme content
The profile below states modules of this taught MSc course. The modules in Term 1 (Autumn) are worth 60 credits, those in Term 2 (Spring) 60 credits, and the project in Term 3 (Summer) another 60 credits, totalling 180 credits. The majority of taught modules are delivered as one-week blocks throughout the 10 weeks of the Autumn or Spring Terms.

Term 1 (or two terms part-time)

Code	*Module title*	*Credits*	*Level*
SEMMA13	Engineering Mathematics and Statistics	10	7
SE4RS11	Research Studies	10	7
SEMDC12	Digital Communications	10	7
SEMSP12	Signal Processing	10	7
SEMCS12	Fundamentals of Control Systems	10	7
SEMIP12	Image Processing	10	7

Term 2 (or two terms part-time)

SE4AD12	Advanced DSP	10	7
SE4DA12	DSP Architectures	10	7

SE4WC12	Advanced Wireless Communications	20	7
SEMPC12	Personal and Mobile Communications	10	7
SE4RW12	Communications for the Real World: Case Study	10	7

Term 3 (or two terms part-time)

SEMPR12	MSc project (can be group project or industry project)	60	7

Part-time or modular arrangements
Part-time students will be able to take the taught elements of the MSc in the Autumn and Spring terms over two consecutive academic years in he following manner.

Year 1:

- Autumn term: SE4RS11, SEMMA13, SEMSP12
- Spring term: SE4AD12, SE4DA12, SEMPC12

Year 2:

- Autumn term: SEMDC12, SEMIP12, SEMCS12
- Spring term: SE4WC12, SE4RW12

The MSc project for part-time students will start in April of the first year of registration and will end in September of the second year of registration.

In addition to the full-time and two year part-time options, the programme is offered on a flexible modular basis, giving the opportunity to individuals who are in full-time employment to gain an MSc in Digital Signal Processing and Communications (180 credits, including a dissertation), a Postgraduate Diploma (120 credits without a dissertation) or a Certificate (60 credits), or to take the taught modules as free-standing CPD courses. Students in the flexible mode will have a maximum of five years to earn up to 180 credits.
The award of the Postgraduate Certificate and the Postgraduate Diploma will be dependent upon the successful completion of 60 credits and 120 credits, respectively, of the course at the same pass marks as for the Masters Degree. Because of the nature of the flexible modular option, students may be awarded the Postgraduate Certificate or Diploma at the termination of any appropriate module.

The maximum study period of five years will allow candidates considerable flexibility in achieving a postgraduate award while continuing to pursue a full-time career in industry. The flexible modular students will take their choice of modules together with the full-time students over the Autumn and Spring terms of each academic year. All the modules last for one term (i.e. 10 weeks). 10-credit modules involves two hours of lecture per week while 20-credit modules involve two hours of lecture as well as a hands-on session or a case study session of two hours per week.

It is also possible to take the taught modules as free-standing training courses and enroll on one of two different basis:

Continuing Professional Development (CPD) undertaking no assessment; as a module with assessment which would then contribute towards a postgraduate qualification (MSc, Diploma, or Certificate).

Progression requirements

Summary of Teaching and Assessment
Teaching is organised in modules that typically involve lectures and tutorial and/or laboratory sessions. Most modules are assessed by a mixture of coursework and formal examination. Some modules are assessed only as coursework. Details are given in the relevant module description.

Awards Classification
Mark Interpretation
70 - 100% Distinction
60 - 69% Merit

50 - 59% Good standard (Pass)
Failing categories:
40 - 49% Work below threshold standard
0 - 39% Unsatisfactory Work

For Masters Degrees
To pass the MSc students must gain an average mark of 50 or more overall including a mark of 50 or more for the project. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.
Students who gain an average mark of 70 or more overall including a mark of 60 or more for the project and have no mark below 40 will be eligible for a Distinction. Those gaining an average mark of 60 or more overall including a mark of 50 or more for the project and have no mark below 40 will be eligible for a Merit.

For PG Diplomas
To pass the Postgraduate Diploma students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.

Students who gain an average mark of 70 or more and have no mark below 40 will be eligible for the award of a Distinction. Those gaining an average mark of 60 or more and have no mark below 40 will be eligible for a Merit.

For PG Certificates
To pass the Postgraduate Certificate students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 10 credits.

Awarding is made by the Examiners' exercising judgement of the category which best represents the candidate's achievement based on the overall level of performance (the weighted average of the marks), on the profile of marks overall, and on any specific restriction which may apply (for accreditation or other proper purposes), taking into account any relevant special circumstances.
Further information on marking criteria, awarding classifications (including the Master's course, Postgraduate Diploma, the Postgraduate Certificate), resits, and resubmissions, is given in the following document: www.reading.ac.uk/Exams/pgaward08-09.pdf.

Admission requirements
Undergraduate Degree
At least a 2.2 Honours UK BSc/BEng degree or overseas equivalent
Degree Discipline
Electrical Engineering, Electronic Engineering, Control Engineering, or any other engineering disciplines with preferably an introductory course in Signal Processing and/or Wireless Communications and adequate mathematical background (which should include linear algebra, matrix theory, probability and statistics, optimisation, and Fourier series). Applications from graduates of Mathematics are also welcome but will be considered on a case-by-case basis.
English
For candidates whose native language is not English, proof of competency is required. The two approved tests are:
IELTS (British Council International English Language Test) - score of 6.5
TOEFL (Test of English as a Foreign Language) - score of 590 (computer based version 243)

Admissions Tutor: C.G.Guy

Support for students and their learning
University support for students and their learning falls into two categories. Learning support is provided by a wide array of services across the University, including: the University Library, the Careers, Placement and Experience Centre (CPEC), In-sessional English Support Programme, the Study Advice and Mathematics Support Centre teams, IT Services and the Student Access to Independent Learning (S@il) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, School Senior Tutors, the Students' Union, the

Medical Practice and advisers in the Student Services Centre. The Student Services Centre is housed in the Carrington Building and offers advice on accommodation, careers, disability, finance, and wellbeing, academic issues (eg problems with module selection) and exam related queries. Students can get key information and guidance from the team of Helpdesk Advisers, or make an appointment with a specialist adviser; Student Services also offer drop-in sessions and runs workshops and seminars on a range of topics. For more information see www.reading.ac.uk/student

Career prospects
Career prospects for the students of this course tend be strong as the DSPC knowledge and skills acquired are very relevant to the current and future DSP and communications industry. Since DSP is now the technology underpinning most signal and sensor related industry areas and wireless communications has penetrated into almost every aspect of today's society, the graduates are expected to be employed in a large variety of sectors. Some graduates will join large multinational companies (DSP companies and telecommunications manufacturers and operators); others join smaller companies and consultancies; and some may well choose to further their research interests either in the School of Systems Engineering or at other Universities.

Opportunities for study abroad or for placements
The Erasmus programme enables students to undertake project work at a number of European Universities.

Programme Outcomes
The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of:

1. Advanced mathematical techniques to help model and analyse DSP systems.
2. Science underlying DSP and wireless communications systems.
3. Information technology as applied in DSP and wireless communications.
4. Real-time or embedded design of DSP systems, including a critical awareness of existing hardware and software design tools.
5. The state of the art, current problems and new insights in the fields of DSP and wireless communications.

Teaching/learning methods and strategies

- The knowledge required for the different topics is obtained via lectures, tutorials, laboratory sessions, assignments and project work.
- Appropriate IT packages are used and introduced when necessary.
- Postgraduate demonstrators in laboratory and project supervisors advise students, and feedback is provided on all continually assessed work.
- By pursuing the course, students are expected to acquire greater initiative and undertake independent research.

Assessment
Most knowledge is tested through a combination of practicals, assignments and formal examinations: students write reports on most assignments and oral presentations are also assessed.

Skills and other attributes

B. Intellectual skills - *able to:*

1. Select and critically apply scientific principles, mathematical and computer based methods for analysing DSP and communications systems.
2. Analyse and solve DSP problems showing self-direction and originality.
3. Be innovative and creative.
4. Organise tasks into a structured form.
5. Understand the evolving state of knowledge in a rapidly developing area.

Teaching/learning methods and strategies

Appropriate mathematical, scientific and IT skills and tools are taught in lectures, and problems to be solved are given as projects or assignments. Project planning is part of the MSc project, and written and oral presentations are required for various assignments and for the MSc project.

Assessment
1-6 are assessed partly by examination, though

6. Transfer appropriate knowledge and methods from one topic in DSP to another.
7. Plan and conduct a research project and write a dissertation.
8. Prepare an oral presentation.

C. Practical skills - *able to:*

1. Use appropriate mathematical methods or IT tools.
2. Program a computer to solve problems especially real-time problems.
3. Use relevant laboratory equipment and analyse the results critically.
4. Research into DSP and wireless communications problems.
5. Manage projects.
6. Present work.

D. Transferable skills - *able to:*

- Use IT tools.
- Acquire, manipulate and process data.
- Use creativity and innovation.
- Solve problems.
- Communicate scientific ideas.
- Give oral presentations.
- Work as part of a team.
- Use information resources.
- Manage time.

sometimes also by project or assignment work. 7 and 8 are assessed as part of project work.

Teaching/learning methods and strategies

- Mathematics and IT tools are introduced in lectures and their use is assessed by examinations and assignments.
- Programming assignments are set, and students may write programs as part of their MSc project.
- Laboratory practicals and the MSc project are used to teach about 3, and the MSc project is used for 4, 5, and 6.

Assessment
1 is tested in coursework and in examinations. 2 is tested by assignments, the MSc project and occasionally by examination, 6 is assessed in assignments and the MSc project. 3 is assessed in practicals and sometimes in the MSc project while 4 and 5 are assessed through project work.

Teaching/learning methods and strategies

Some IT tools are taught in lectures, but most through laboratory sessions and assignments. Data skills are acquired in laboratory and projects. Creativity, innovation and problem solving are experienced through the MSc project, time management and presentations. Team working skills are acquired through laboratory work. Use of information resources, such as the library and IT methods, is experienced through projects and assignments.

Assessment
Some skills, like the use of IT tools and the ability to communicate orally and in written form are directly assessed, in assignments or through the MSc project, other skills are not directly assessed but their effective use will enhance the students' overall performance.

Please note: this specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students,

quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.

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